

The Claims

What is claimed is:

- 1 1. A transconnector for coupling first and second longitudinal spinal rods, the
2 transconnector comprising:
3 a first member having a first hook portion sized and configured to engage the
4 first rod and a projection associated with the first hook portion, wherein the projection is an
5 elongated member having an arcuate section with a relatively flat top surface;
6 a second member having a second hook portion sized and configured to
7 engage the second rod and a cavity having at least one opening sized and configured to
8 receive at least a portion of the projection; and
9 a locking assembly for securing different separation distances and angular
10 orientation between the first and second members, the locking assembly having a first end
11 accessible by a user to rotate at least a portion of the locking assembly to prevent at least one
12 of the translational or rotational movement of the first member with respect to the second
13 member;
14 wherein the locking assembly has at least a first position permitting the first
15 member to slide and rotate with respect to the second member, with the first hook portion of
16 the first member at a user selected angle relative to the second hook portion, and at least a
17 second position preventing at least one of translational or rotational movement of the first
18 member with respect to the second member.
- 1 2. The transconnector of claim 1 wherein rotation of the first end of the locking
2 assembly presses the projection against the cavity.
- 1 3. The transconnector of claim 1 wherein a second end of the locking assembly
2 directly or indirectly engages the projection to prevent movement of the first member with
3 respect to the second member.
- 1 4. The transconnector of claim 1 wherein the locking assembly consists of a
2 single screw.
- 1 5. The transconnector of claim 1 wherein the locking assembly is operatively
2 associated with the projection to limit travel of the first member to prevent uncoupling of the
3 first and second members.

1 6. The transconnector of claim 1 wherein the flat surface of the projection further
2 includes a medial wall.

1 7. The transconnector of claim 6 wherein the projection further includes side
2 edges at the juncture of the flat surface and the arcuate portion.

1 8. The transconnector of claim 7 wherein interaction of the locking assembly and
2 the medial wall prevents uncoupling of the first and second members.

1 9. The transconnector of claim 8 wherein the side edges limit rotation of the
2 projection in the cavity.

1 10. The transconnector of claim 9 wherein interaction of the locking assembly
2 with the side edges limits rotation of the projection in the cavity.

1 11. The transconnector of claim 1 wherein the first hook portion of the first
2 member has a throughhole therein, and the projection of the first member has an aperture, the
3 first member further comprising a shaft member extending through both the throughhole and
4 the aperture forming an axis of rotation about which the hook portion of the first member
5 may articulate with respect to the projection.

1 12. The transconnector of claim 11 wherein the shaft member comprises a
2 threaded screw.

1 13. The transconnector of claim 12 wherein the shaft member is adjustable to lock
2 the hook portion of the first member with respect to the projection.

1 14. The transconnector of claim 1 wherein the projection comprises an edge
2 formed by the junction between the arcuate portion and the flat surface, the edge and the
3 cavity being sized and configured to limit angulation of the first member with respect to the
4 second member.

1 15. The transconnector of claim 1 wherein at least a portion of the projection
2 limits angulation of the first member with respect to the second member.

1 16. The transconnector of claim 1 wherein the locking assembly in the second
2 position prevents both translational and rotational movement of the first member within
3 respect to the second member.

1 17. The transconnector of claim 1 wherein the second member has a threaded
2 opening sized and configured to threadedly receive the locking assembly.

1 18. The transconnector of claim 17 wherein the locking assembly comprises a set
2 screw that directly or indirectly engages the projection to substantially prevent movement of
3 the first member with respect to the second member.

1 19. The transconnector of claim 18 wherein the threaded opening has a central
2 axis, the central axis is substantially perpendicular to the projection.

1 20. The transconnector of claim 1 wherein the cavity is integrally formed with the
2 hook portion of the second member.

1 21. The transconnector of claim 1 wherein the first hook portion of the first
2 member is integrally formed with the projection.

1 22. The transconnector of claim 1 wherein the first member comprises:
2 a first body portion having a lateral end incorporating the first hook portion of
3 the first member and a medial end;
4 a second body portion having a medial end incorporating the projection of the
5 first member and a lateral end engaging the medial end of the first body portion; and
6 a locking element for securing the first body portion with respect to the second
7 body portion.

1 23. The transconnector of claim 22 wherein the medial end of the first body
2 portion includes a first textured surface; the lateral end of the second body portion includes a
3 second textured surface mating with the first textured surface; and the first textured surface is
4 rotatable with respect to the second textured surface for accommodating convergence or
5 divergence between the first and second members.

1 24. The transconnector of claim 23 wherein the first and second textured surfaces
2 include a star-grind pattern.

1 25. The transconnector of claim 24 wherein the locking element comprises:
2 a first hole through the medial end of the first body portion;
3 a second hole through the lateral end of the second body portion aligned with
4 the first hole; and
5 a cap screw insertable in the first and second holes.

1 26. The transconnector of claim 25 wherein the cap screw has a first end for
2 receiving a tool to turn the cap screw and a second end with a retaining ring for preventing
3 removal of the cap screw from the second hole.

1 27. The transconnector of claim 26 wherein the cap screw has a body with threads
2 and the second hole is threaded for threadably receiving the cap screw.

1 28. The transconnector of claim 27 wherein the second hole includes a collar and
2 the retaining ring includes a resilient member, the resilient member flexing inward upon
3 insertion of the cap screw through the second hole and flexing outward once the resilient
4 member is past the collar for preventing removal of the cap screw.

1 29. The transconnector of claim 28 wherein the resilient member includes an end
2 of the cap screw with a lip and a plurality of slits.

1 30. The transconnector of claim 1 wherein the first hook portion of the first
2 member and the second hook portion of the second member each includes a threaded hole
3 and a clamping screw threadably received in the respective threaded hole for securing the
4 first and second spinal rods to the first and second members, respectively.

1 31. The transconnector of claim 30 wherein each clamping screw has a first end
2 for receiving a tool to turn the clamping screw, a threaded cylindrical first body portion, and a
3 conical second body portion.

1 32. The transconnector of claim 31 wherein the first hook portion of the first
2 member and the second hook portion of the second member each comprises a tip portion and
3 a curved portion having a radius of curvature larger than that of the first and second spinal
4 rods, respectively.

1 33. The transconnector of claim 32 wherein the first and second spinal rods are
2 clamped between the conical second body portion of each clamping screw and a region near
3 the tip portion of the first and second hook portion, respectively.

1 34. A transconnector for coupling first and second elongate spinal fixation
2 elements, the transconnector comprising:

3 a first member having a linking portion configured and dimensioned to receive at least
4 one of the fixation elements, and a projection associated with the linking portion, the
5 projection having an arcuate portion with a relatively flat planar surface defining edges at the
6 juncture of the flat planar surface and the arcuate portion;

7 a second member having a linking portion configured and dimensioned to receive at
8 least one of the fixation elements, and a cavity having at least one opening to receive at least
9 a portion of the projection; and

10 a locking assembly for securing different separation distances between the first and
11 second fixation elements, the locking assembly having a first end accessible by a user to
12 rotate at least a portion of the locking assembly to limit translational travel of the first
13 member with respect to the second member,

14 wherein the locking assembly has at least a first position permitting the first member
15 to slide with respect to the second member, with the linking portion of the first member at a
16 user selected angle relative to the linking portion of the second member, and at least a second
17 position preventing translational movement of the first member with respect to the second
18 member.

1 35. The transconnector of claim 34 wherein rotation of the first end of the locking
2 assembly presses the projection against the cavity.

1 36. The transconnector of claim 34 wherein a second end of the locking assembly
2 directly or indirectly engages the projection to prevent movement of the first member with
3 respect to the second member.

1 37. The transconnector of claim 34 wherein the locking assembly consists of a
2 single screw.

1 38. The transconnector of claim 34 wherein the locking assembly is operatively
2 associated with the projection to limit travel of the first member to prevent uncoupling of the
3 first and second members.

1 39. The transconnector of claim 34 wherein the flat surface of the projection
2 further includes a medial wall.

1 40. The transconnector of claim 39 wherein interaction of the locking assembly
2 and the medial wall prevents uncoupling of the first and second members.

1 41. The transconnector of claim 40 wherein the edges limit rotation of the
2 projection in the cavity.

1 42. The transconnector of claim 41 wherein interaction of the locking assembly
2 with the side edges limits rotation of the projection in the cavity.

1 43. The transconnector of claim 34 wherein the first linking portion of the first
2 member has a throughhole therein, and the projection of the first member has an aperture, the
3 first member further comprising a shaft member extending through both the throughhole and
4 the aperture forming an axis of rotation about which the linking portion of the first member
5 may articulate with respect to the projection.

1 44. The transconnector of claim 43 wherein the shaft member comprises a
2 threaded screw.

1 45. The transconnector of claim 44 wherein the shaft member is adjustable to lock
2 the linking portion of the first member with respect to the projection.

1 46. The transconnector of claim 34 wherein the edges and the cavity are sized and
2 configured to limit angulation of the first member with respect to the second member.

1 47. The transconnector of claim 34 wherein at least a portion of the projection
2 limits angulation of the first member with respect to the second member.

1 48. The transconnector of claim 34 wherein the second member has a threaded
2 opening sized and configured to threadedly receive the locking assembly.

- 1 49. The transconnector of claim 48 wherein the locking assembly comprises a set
2 screw that directly or indirectly engages the projection to substantially prevent movement of
3 the first member with respect to the second member.
- 1 50. The transconnector of claim 49 wherein the threaded opening has a central
2 axis, the central axis is substantially perpendicular to the projection.
- 1 51. The transconnector of claim 34 wherein the cavity is integrally formed with
2 the linking portion of the second member.
- 1 52. The transconnector of claim 34 wherein the linking portion of the first member
2 is integrally formed with the projection.
- 1 53. The transconnector of claim 34 wherein the first member comprises:
2 a first body portion having a lateral end incorporating the first linking portion
3 of the first member and a medial end;
4 a second body portion having a medial end incorporating the projection of the
5 first member and a lateral end engaging the medial end of the first body portion; and
6 a locking element for securing the first body portion with respect to the second
7 body portion.
- 1 54. The transconnector of claim 53 wherein the medial end of the first body
2 portion includes a first textured surface; the lateral end of the second body portion includes a
3 second textured surface mating with the first textured surface; and the first textured surface is
4 rotatable with respect to the second textured surface for accommodating convergence or
5 divergence between the first and second members.
- 1 55. The transconnector of claim 54 wherein the first and second textured surfaces
2 include a star-grind pattern.
- 1 56. The transconnector of claim 53 wherein the locking element comprises:
2 a first hole through the medial end of the first body portion;
3 a second hole through the lateral end of the second body portion aligned with
4 the first hole; and
5 a cap screw insertable in the first and second holes.

1 57. The transconnector of claim 56 wherein the cap screw has a first end for
2 receiving a tool to turn the cap screw and a second end with a retaining ring for preventing
3 removal of the cap screw from the second hole.

1 58. The transconnector of claim 57 wherein the cap screw has a body with threads
2 and the second hole is threaded for threadably receiving the cap screw.

1 59. The transconnector of claim 58 wherein the second hole includes a collar and
2 the retaining ring includes a resilient member, the resilient member flexing inward upon
3 insertion of the cap screw through the second hole and flexing outward once the resilient
4 member is past the collar for preventing removal of the cap screw.

1 60. The transconnector of claim 59 wherein the resilient member includes an end
2 of the cap screw with a lip and a plurality of slits.

1 61. The transconnector of claim 34 wherein the first linking portion of the first
2 member and the second linking portion of the second member each includes a threaded hole
3 and a clamping screw threadably received in the respective threaded hole for securing the
4 first and second spinal fixation elements to the first and second members, respectively.

1 62. The transconnector of claim 61 wherein each clamping screw has a first end
2 for receiving a tool to turn the clamping screw, a threaded cylindrical first body portion, and a
3 conical second body portion.

1 63. The transconnector of claim 62 wherein the first linking portion of the first
2 member and the second linking portion of the second member each comprises a tip portion
3 and a curved portion having a radius of curvature larger than that of the first and second
4 spinal fixation elements, respectively.

1 64. The transconnector of claim 63 wherein the first and second spinal fixation
2 elements are clamped between the conical second body portion of each clamping screw and a
3 region near the tip portion of the first and second linking portions, respectively.

1 65. A transconnector for coupling first and second longitudinal spinal rods, the
2 transconnector comprising:

3 a first member having a first hook portion sized and configured to engage the
4 first rod and a projection associated with the first hook portion, wherein the projection is an
5 elongated member having an arcuate portion with at least one relatively flat surface;

6 a second member having a second hook portion sized and configured to
7 engage the second rod and a cavity having at least one opening sized and configured to
8 receive at least a portion of the projection; and

9 a locking assembly for securing different separation distances and angular
10 orientation between the first and second members, the locking assembly having a first end
11 and a second end, the first end being accessible to a user so that rotation of the first end of the
12 locking assembly causes the second end of the locking assembly to directly or indirectly
13 engage the projection;

14 wherein rotation of the first end of the locking assembly further moves the
15 transconnector from a first position to a second position, the first position permitting the first
16 member to slide and rotate with respect to the second member, with the first hook portion of
17 the first member at a user selected angle relative to the second hook portion of the second
18 member, the second position preventing at least one of translational or rotational movement
19 of the first member with respect to the second member.

1 66. The transconnector of claim 65 wherein rotation of the first end of the locking
2 assembly presses the projection against the cavity.

1 67. The transconnector of claim 65 wherein the locking assembly consists of a
2 single screw.

1 68. The transconnector of claim 65 wherein the locking assembly is operatively
2 associated with the projection to limit travel of the first member to prevent uncoupling of the
3 first and second members.

1 69. The transconnector of claim 65 wherein the flat surface of the projection
2 further includes a medial wall.

1 70. The transconnector of claim 69 wherein the projection further includes side
2 edges at the juncture of the flat surface and the arcuate portion.

1 71. The transconnector of claim 70 wherein interaction of the locking assembly
2 and the medial wall prevents uncoupling of the first and second members.

1 72. The transconnector of claim 71 wherein the side edges limit rotation of the
2 projection in the cavity.

1 73. The transconnector of claim 72 wherein interaction of the locking assembly
2 with the side edges limits rotation of the projection in the cavity.

1 74. The transconnector of claim 65 wherein the first hook portion of the first
2 member has a throughhole therein, and the projection of the first member has an aperture, the
3 first member further comprising a shaft member extending through both the throughhole and
4 the aperture forming an axis of rotation about which the hook portion of the first member
5 may articulate with respect to the projection.

1 75. The transconnector of claim 74 wherein the shaft member comprises a
2 threaded screw.

1 76. The transconnector of claim 74 wherein the shaft member is adjustable to lock
2 the hook portion of the first member with respect to the projection.

1 77. The transconnector of claim 65 wherein the projection comprises an edge
2 formed by the junction between the arcuate portion and the flat surface, the edge and the
3 cavity being sized and configured to limit angulation of the first member with respect to the
4 second member.

1 78. The transconnector of claim 65 wherein at least a portion of the projection
2 limits angulation of the first member with respect to the second member.

1 79. The transconnector of claim 65 wherein the locking assembly in the second
2 position prevents both translational and rotational movement of the first member within
3 respect to the second member.

1 80. The transconnector of claim 65 wherein the second member has a threaded
2 opening sized and configured to threadedly receive the locking assembly.

1 81. The transconnector of claim 80 wherein the locking assembly comprises a set
2 screw that directly or indirectly engages the projection to substantially prevent movement of
3 the first member with respect to the second movement.

1 82. The transconnector of claim 81 wherein the threaded opening has a central
2 axis, the central axis is substantially perpendicular to the projection.

1 83. The transconnector of claim 65 wherein the cavity is integrally formed with
2 the hook portion of the second member.

1 84. The transconnector of claim 65 wherein the first hook portion of the first
2 member is integrally formed with the projection.

1 85. The transconnector of claim 65 wherein the first member comprises:
2 a first body portion having a lateral end incorporating the first hook portion of
3 the first member and a medial end;
4 a second body portion having a medial end incorporating the projection of the
5 first member and a lateral end engaging the medial end of the first body portion; and
6 a locking element for securing the first body portion with respect to the second
7 body portion.

1 86. The transconnector of claim 85 wherein the medial end of the first body
2 portion includes a first textured surface; the lateral end of the second body portion includes a
3 second textured surface mating with the first textured surface; and the first textured surface is
4 rotatable with respect to the second textured surface for accommodating convergence or
5 divergence between the first and second members.

1 87. The transconnector of claim 86 wherein the first and second textured surfaces
2 include a star-grind pattern.

1 88. The transconnector of claim 85 wherein the locking element comprises:
2 a first hole through the medial end of the first body portion;
3 a second hole through the lateral end of the second body portion aligned with
4 the first hole; and
5 a cap screw insertable in the first and second holes.

1 89. The transconnector of claim 88 wherein the cap screw has a first end for
2 receiving a tool to turn the cap screw and a second end with a retaining ring for preventing
3 removal of the cap screw from the second hole.

1 90. The transconnector of claim 89 wherein the cap screw has a body with threads
2 and the second hole is threaded for threadably receiving the cap screw.

1 91. The transconnector of claim 90 wherein the second hole includes a collar and
2 the retaining ring includes a resilient member, the resilient member flexing inward upon
3 insertion of the cap screw through the second hole and flexing outward once the resilient
4 member is past the collar for preventing removal of the cap screw.

1 92. The transconnector of claim 91 wherein the resilient member includes an end
2 of the cap screw with a lip and a plurality of slits.

1 93. The transconnector of claim 65 wherein the first hook portion of the first
2 member and the second hook portion of the second member each includes a threaded hole
3 and a clamping screw threadably received in the respective threaded hole for securing the
4 first and second spinal rods to the first and second members, respectively.

1 94. The transconnector of claim 93 wherein each clamping screw has a first end
2 for receiving a tool to turn the clamping screw, a threaded cylindrical first body portion, and a
3 conical second body portion.

1 95. The transconnector of claim 94 wherein the first hook portion of the first
2 member and the second hook portion of the second member each comprises a tip portion and
3 a curved portion having a radius of curvature larger than that of the first and second spinal
4 rods, respectively.

1 96. The transconnector of claim 95 wherein the first and second spinal rods are
2 clamped between the conical second body portion of each clamping screw and a region near
3 the tip portion of the first and second hook portion, respectively.